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The International Organisation of Plant Taxonomy and the position of I.A.P.T. and I.U.B.S.

by

J. Lanjouw (Utrecht)

Now that the I.A.P.T. has been in existence for some years, and the line in which it is developing begins to take shape, it seems worth while to consider its position among the international organisations that aim at an effective coöperation in the field of botany, in the first place therefore with regard to the I.U.B.S.

The opinions of my colleagues on the relative importance and the inter-relationship of the I.A.P.T. and the I.U.B.S. appear to differ widely. Part of these differences of opinion, however, rest on the fact that they are often insufficiently acquainted with the aim and scope of the work that is performed by these organisations.

It is to be regretted that I myself, because of my close connection with the I.A.P.T., have become involved in the controversies between these organisations, but I will do my best to consider the problem as objectively as possible, and I hope that I will succeed. I also hope that my exposition will lead to a fruitful debate. In order to obviate the danger that the latter degenerates into a squabble on personal matters, I will refrain myself from quoting views expressed by other botanists.

If we look back, it appears that the international organisation in the field of Plant Taxonomy rests for a large part on the activities of the "International Botanical Congress". Our so preëminently international "Committee of Nomenclature" actually was, at least up to the Stockholm Congress, a committee appointed by the "International Botanical Congress". This, however, must be regarded as a somewhat uncertain foundation, for the "International Botanical Congress" itself has no definite legal status, its subsistence merely resting on tradition. A "Congress" is held because it was decided at the previous "Congress" that it should be held, and it is itself supposed to take a similar decision with regard to a future one, and although we will have to admit that the results obtained with this conservative anarchism did not prove unsatisfactory, it does not seem too bold to surmise that the future of the "Congress" would be better secured if it was given some kind of legal base.

Let us consider first of all the development of the situation in the field of Nomenclature, and the difficulties with which the latter had to contend. It appears that a great deal of its success has always depended, and still depends, on the interest taken in this subject by the "Organising Committee of the Congress", for it is this Committee that appoints the Rapporteur-Général. It is true that there is no law that prescribes this procedure, but as far as I know it has always been followed. The members of the "Committee of Nomenclature" are appointed by the "Congress" itself. From a juridical point of view this is a most curious situation. The "Congress", a group of more or less accidentally meeting persons, which has no legal status whatever, appoints an international committee whose faculties have nowhere been defined! Another peculiarity of this committee is that no provisions have been made to supply it with the funds it needs for performing its functions. This organisatory inadequacy is one of the things that have set me thinking. The task of the Rapporteur-Général is to report to the "Congress" on all proposals that intend to effect changes in the Rules of

Nomenclature. Part of these proposals are sent in by special committees that have been appointed by the "Congress", and part of them is received from private persons or from groups of persons. In order to receive them in time for the next "Congress" circulars have to be sent out, and when the proposals have come in, a synopsis has to be prepared and distributed. Especially for the last-named part of his task the Rapporteur-Général wants funds, but as no special provisions have been made, it is left to him to find the required amount. When the proposals have been discussed by the "Section of Nomenclature" of the "Congress", the main contents and the results of the discussions have to be published, but here the Rapporteur-Général is once more confronted with the same difficulty, for the "Congress" has no funds. From this it will be clear that the Rapporteur-Général has to spend a rather important part of his time in collecting funds.

What I have related above of the financial difficulties of the Rapporteur-Général and the Committee of Nomenclature, applies also, mutatis mutandis, to the other internationally important activities of the taxonomists, and here we come to the function of the second international organisation in the field of botany, the I.U.B.S. *). This organisation was founded by a convention of states in order to create the conditions for a more effective international coöperation in the field of biology. The participating states provide the necessary funds for its maintenance, the contributions being more or less proportional to the size of their population. It is true that the number of participating states is comparatively large, but as the contributions are rather low, the financial position of the I.U.B.S. was, especially before the last war, more or less precarious. After the war its position improved because of the subsidies it received from the U.N.E.S.C.O.

The I.U.B.S. is divided in sections, the number of which underwent an increase after the war. At the present moment the situation is so that the entirely or partly botanical sections form a minority. This finds its reflection in the composition of the Board, among whose members there is at present but one botanist. It appeared also at the joint meeting held by the Board with representatives of the Sections in March of this year, for at that meeting but one in six of the participants proved to be a botanist. This does not mean that the botanical interests are neglected by the I.U.B.S., but it must nevertheless certainly be regarded as an undesirable situation. The fault may partly lie with the botanists themselves, who may have been insufficiently enthusiastic, but there can be no doubt that the entirely different principles on which the botanists and the zoölogists have based their Sections, have played an important part. The Botanical Section consists of a large number of committees and of a subsection for taxonomy, a form of organisation that aims at the preservation of unity in the field of botany. This would have been a good plan if the zoölogists had placed themselves on the same standpoint. The latter, however, followed an entirely different line, and formed quite a number of Sections, the so-called Zoölogical Section practically being confined to taxonomists. An improvement would be obtained by raising the status of the Subsection for Plant Taxonomy to that of a Section, but a complete reorganisation of the present Section would be more the point. It seems to me that we even ought to go further, and that the I.U.B.S. should be split into three separate Unions, viz. a zoölogical one, a botanical one and one in which those sciences are brought together in which it is not of primary importance whether the organisms are animals or plants, e.g. genetics, cell physiology, biochemistry and biophysics. In the other biological sciences the botanical and the zoölogical side have so few points of contact that they must feel more at home in separate Unions. Some of us will find this regrettable, but it seems to me that we should not close our eyes for the obvious fact that it is practically impossible to establish a serviceable contact.

Although most biologists will admit that the reorganisation advocated by me is logically better founded than the present organisation, it does not seem probable that a majority could be found for it in the I.U.B.S. It would, of course, mean a splitting of the available funds, and as a result some of the subdivisions would come into a less favourable situation. It might be argued that my proposal is an attempt to obtain better conditions for plant taxonomy, but this is not so. In fact, if it was accepted, it would by no means be impossible that plant taxonomy would in the next future have to content itself with a smaller subsidy. This, however, is no argument of decisive value. Our aim must be to create better con-

*) International Union of Biological Sciences.

ditions for international coöperation so that it becomes possible to carry out projects of international importance. To this end we need a sound organisation, in which every individual part is given a fair chance for further development.

So far I have left our own organisation, the I.A.P.T., out of consideration. The plans for the creation of this organisation were contrived by me. After discussing the idea with some of my colleagues I submitted a preliminary concept to the conference that was held in 1948 under the auspices of the I.U.B.S. at Utrecht, and whose main object was to consider proposals for changes in the Rules of Nomenclature. The I.A.P.T. was definitely founded at the Stockholm Congress, and it was decided at that occasion that it should be affiliated with the I.U.B.S.

On account of this decision to establish a permanent contact with the I.U.B.S., it seems worth while to pay some attention to the situation found in the other International Unions. We find then that the International Union for Geodesy and Geophysics consists entirely of International Associations. In the I.U.B.S. this applies to a few sections only. The Microbiological Section rests on an International Association, and more recently the Embryological Section too has found a solid foundation in such an Association. The Association of Plant Morphologists, on the other hand, has no status in the I.U.B.S. The I.A.P.T., with a number of members that has risen now to circ. 660, is by far the largest of the Botanical Associations, but it has not yet obtained the status of a Section in the I.U.B.S. It seems to me that our first aim should be to rectify this. It may be achieved if the national organisations of plant taxonomists can persuade the delegates of their country to give us their support when the matter is discussed at the next general meeting of the I.U.B.S.

I know that several of our members and especially of the younger ones have raised the question whether it would not be better for the I.A.P.T. to sever its connections with the I.U.B.S. and to make itself completely independent, but this would in my opinion be inadvisable. The I.U.B.S. is an organisation that since its foundation shortly after the first world war has performed good work and it did so with regard to the I.A.P.T. too. In fact it seems improbable that the latter would have been able to maintain itself without the aid received from the I.U.B.S. The I.U.B.S. has given itself much trouble and has spent a good deal of money to encourage international coöperation in the field of Plant Taxonomy, and for this reason it certainly has a claim on our gratitude. This should not be answered by a separatist action. Such an action might be qualified as truly destructive, moreover, it would probably prove suicidal. Our endeavours to arrive at an international organisation would doubtless suffer a setback of years.

Finally I wish to make a few remarks on the work of U.N.E.S.C.O. That the activity of the I.U.B.S. in the field of international coöperation has so strongly increased since the end of the second world war, is due to the financial support it received from U.N.E.S.C.O. The latter uses the services of the International Unions for the allocation of its subsidies, and the amount of the latter depends, apart from the amount that is available, on the activity of the Union that is concerned in the application, and on the effectiveness of its organisation. The more effective we can make the organisation of the I.U.B.S. and the more active it proves to be, the more generously it will be treated by U.N.E.S.C.O., and in the same measure our possibilities for further development will increase.

The exposition given above may be summarized in the three following points.

1° It is desirable that the present I.U.B.S. be replaced by three separate Unions, one for the various branches of Botany, one for those of Zoölogy and one for those branches of Biology in which the question whether the organisms dealt with are plants or animals is of subordinate importance.

2° It is desirable that the various branches of Botany be represented by Sections, and that the latter be based on International Associations.

3° Even if at the moment the desiderata mentioned under 1° and 2° should prove to be unrealizable, Plant Taxonomy should obtain the status of a Section, and this Section should be based on the I.A.P.T.

It should be noted that these proposals are made by me on my own responsibility and not in my quality as a member of the Board of the I.A.P.T. I can add that I did not even discuss them with the other members of this Board. It seemed better to postpone such a

discussion in order to give the members of the I.A.P.T. an opportunity to form an unbiased opinion on this matter. In this way they will not have the feeling that a definite line of conduct is forced upon them. It would be a great satisfaction to me if the members would carefully consider the matter, for the proposals relate to questions that touch the root of our organisation, and on whose solution the latter's future depends. So far the position of the I.A.P.T. is juridically as anomalous as that of its predecessors. We have a society, there is a board, there is even an International Bureau, but there are no rules by which the rights and duties of the members are defined and there is no authorization for the board. During the first years this was perhaps allright, for it allowed us the necessary liberty. For two years it was still difficult to see in what direction the I.A.P.T. would develop, and it would probably have proved a serious impediment if we had been bound by hard and fast rules. However, we are now so far that it seems desirable to lay down some regulations, and it seems to me that the general meeting of the I.A.P.T. that is to be held in 1954 in Paris would offer a suitable opportunity to do this. For the time being these rules should confine themselves to some main points; details can be filled in afterwards.

The Teaching of Angiosperm Taxonomy in Universities

by *)

W. B. Turrill (Kew)

I started taxonomy when I was pushed in an old-fashioned perambulator along the roads and lanes of Oxfordshire. As a result of sixty odd years' experience as a student, teacher, and working taxonomist I am tempted to suggest that taxonomy cannot be taught. What can be done is to train a student to teach himself taxonomy, to explain to him its aims, principles, and methods, and to encourage him to experiment for himself in this great field of botany. However, attempts to teach taxonomy have been made in the past, are being made, and presumably will continue to be made. As a taxonomist one naturally prepares a classification of the attempts up-to-date.

The following arrangement can, no doubt, be greatly improved but is, perhaps, sufficient to start arguments. There are, in it, two major groups with four subordinate ones under one and two under the other.

A. Special
   1. Direct.
   2. Historical.
   3. Philosophical.
   4. Phylogenetic.

B. General
   5. Practical.
   6. Synthetic.

1. *Direct.* This teaching method is the old fashioned one of taking some well-known system of families and describing the characters usually of a selected number of families with some details of some of their genera. With nine out of ten teachers it is deadly dull to 99 % of the students. Its monotony can be relieved by careful development of comparisons, reference to affinities, notice of economic products, and so on. In theory, it should give a wide basis of facts without which the other special methods of teaching taxonomy can only consist in the main of dogmatic statements.

2. *Historical.* That students should have some knowledge of the history of taxonomy is obviously desirable. It is, however, doubtful if the historical approach would appeal to many of them or would be suitable as a basis for teaching. Personal names and dates are of importance in nomenclature as at present established by international rules. There have been and are a number of outstanding workers in plant taxonomy with whose publications every student should have some acquaintance. Most important are the recognition of trends in the subject and these must necessarily be dealt with, in part, historically. To treat the whole subject as history would, however, mean that the student would have to learn much that has little or no modern use. A further point is that maturity of mind is needed properly to appreciate historical relations.

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*) A paper read at the Belfast meeting of the British Association for the Advancement of Science, 5 Sept. 1952.

3. *Philosophical.* The philosophical approach can be made most interesting but it meets with an initial difficulty. Properly to appreciate the philosophy of taxonomy is only possible after considerable practical experience and the accumulation of a considerable number of facts. Though this difficulty cannot be entirely overcome it is desirable that the student should know something of the purposes and principles of taxonomy fairly early in his training. Instruction should be given undogmatically with consideration of a wide range of concrete illustrative examples, which may well range from the classification of books in a library or stone implements to specimens of living plants. Later, near the end of his courses, the student should again be helped to consider "what taxonomy is all about" and to provide his own philosophical background for it.

4. *Phylogenetic.* The easiest way to lecture to students on angiosperm taxonomy is constantly to refer to phylogenetic schemes. In this way characters can be readily compared and contrasted in different taxa. Memory can be greatly aided. References to evolution catch the imagination and suggest a dynamic not a static standpoint. There is no doubt that phylogenetic speculations and hypotheses can lead to very useful suggestions for research. The danger, especially in teaching, is that such speculations tend to be taken as established facts. All phylogenetic hypotheses served up to students should be seasoned with the scepticism of rival speculations. For the angiosperms we have as yet meagre evidence for the origin and history of the group itself or for any of its component taxa except here and there at about the species level. This does not in any way involve a criticism of phylogenetic investigations but it does suggest that it is unwise to instil any phylogenetic scheme into the minds of students in such a way that later they may have difficulty in breaking away from it.

5. *Practical.* There are, of course, many degrees of "teaching by practice". The student may be dumped into the middle of a mass of material and told to make the best he can of it. He may, or may not, be advised to use certain textbooks or floras. The teacher may guide and advise him almost continuously or at rare intervals. The essential point is that the student shall handle material himself and learn how to work out characters, constancies, and correlations from specimens, not from lecture notes, and without too much reference to books. There are many advantages of this method; the keen students are soon recognizable, initiative is at a premium, what is learnt is fixed with relative ease and permanence, the research habit is developed. For purposes of keeping to a syllabus or for passing most orthodox examinations the method has disadvantages for it is slow and tends to be diffuse.

6. *Synthetic.* It is obvious that all the methods mentioned have good and bad aspects. The question must be faced — is it possible to select and combine the good while rejecting the bad? In answering "yes" there are reservations, stipulations, and limitations. The remainder of this short discourse is concerned with recognizing some of these and in making suggestions for overcoming them as far as is possible.

It must first be noted that there are two kinds of botanists: taxonomists and non-taxonomists. The universities should, of course, provide for a flow of each. Since, however, both kinds are designated "botanists" it is essential that the non-taxonomists should have a sound and sufficiently wide knowledge of taxonomy to be able properly to appreciate its purposes, methods, and problems. The converse is as obviously true. One cannot avoid the difficulties of having elementary and advanced, or better general and specialized, courses in taxonomy. The main difficulties are with the former and time is the principal limiting factor. In spite of this difficulty I have no doubt that taxonomy should be learnt with a minimum of lectures and a maximum of practice.

Students taking botany at a university presumably have some outline knowledge of the subject. They have probably taken botany for their matriculation and often now-a-days for their intermediate (or equivalent) examinations and from the study of a limited number of types have learnt something of morphology and terminology and of the functions of organs.

Taxonomy proper cannot be learned by the study of isolated unconnected examples, i.e. by what used to be referred to as the "type method". Its very essence is detection of correlations by comparison. There must, of course, be selection from the wealth of material because of the time factor but too early specialization must also be avoided. One lecture introducing the subject is probably desirable. In this there should be explained, very briefly, the need for a universally recognized system whereby one can refer precisely to this or that kind of plant

out of the million or more kinds on the face of the earth and in the waters thereof. A second practical aspect of taxonomy to be emphasized is that it becomes, and more and more will become, a repository of facts of structure, composition, and function. The theories of classification, and of taxonomy in particular, should be very briefly outlined at this stage.

The students should then be taken into the field and turned loose to work out the flora of an area for themselves with no more than a couple of copies of Clapham, Tutin, and Warburg to every dozen students. No help should be given by the teacher till the day's results are available for criticism and discussion. This process should be repeated as often as possible. It is good for the students and even better for the teacher. Somewhat later there should be concentration on one or a few families — not as "types" but for the practical study of character evaluations, correlations, variation, and reticulation. At first this should be mainly practical and limited to the local flora. One suggests *Ranunculaceae, Caryophyllaceae, Rosaceae, Leguminosae,* and *Scrophulariaceae* as suitable. Then there should be a study of a single genus in detail, say *Ranunculus, Stellaria, Potentilla, Trifolium,* or *Veronica,* extended to extra British species to a certain extent. This should be combined with instruction in "species questions" based on concrete examples. The care with which comparative diagnoses and descriptions must be prepared and the importance of dissections should be emphasized. Intraspecific variation and inter-specific hybridization must be studied by population analyses.

It is most important that even general students should obtain some broad insight into the one great fact better illustrated by taxonomy than by any other branch of botany — the tremendous variation in structure and behaviour in the plant kingdom and even in the flowering plants. The play upon a central theme, the abrupt breakdown in correlations, the varied interplay of structure and function, and many another phenomenon of variation should capture the interest, imagination, and intelligence of any student who is genetically capable of becoming a botanist. The British flora is too limited fully to furnish material for this. Hence it is desirable to introduce students to examples they cannot meet in the field without foreign travel. It is suggested that a study should be made of at least one tropical family, of which a good selection of material should be available, and an outline view of half-a-dozen other exotic families should be obtained by photographs, drawings, and some specimens. Appropriate families can be selected according to the knowledge of the teacher and the possibilities of obtaining material. The following list is meant only as a guide: *Palmae, Bromeliaceae, Lauraceae, Hamamelidaceae, Rutaceae, Sterculiaceae, Dipterocarpaceae, Passifloraceae, Cactaceae, Rhizophoraceae, Myrtaceae, Loganiaceae, Asclepiadaceae,* and *Bignoniaceae.* Opportunities should be made to visit well-stocked botanic gardens and the students' exhibitions held at Kew from time to time.

It is debatable at what point in the course further instruction on the principles of theories of classification should be given. I am inclined to think that a full outline should be deferred till the student has sufficient facts gathered by personal experience to appreciate the linkage of practice and theory but suggestive generalization should be introduced gradually as factual knowledge grows. It can of course be argued that theories provide most useful pigeon holes for filing facts and serve as aids to memory. This is not their main purpose and unless theories and hypotheses can be at least illustrated from the students' own observations they can only be taught dogmatically with all the dangers this implies. It is true that the interest of students has to be aroused and maintained and the judicious use of imagination and speculation helps to do this but it is much better gently to train the student to form opinions for himself. However, we have a number of well-known systems of division into and arrangement of angiosperm families and some idea of the structure of these must be given together with a summary of the principles on which they are stated to be based. Too much time should not be spent on this by the general student and much better training can be given if emphasis be placed on modern methods and outlooks than on historical subjects.

It is at and below the species level that one not only comes to grip with most of the problems of angiosperm classification but with new methods of investigating them. Here, to comparison can be added experiment and much from ecology, cytogenetics, biochemistry, and other modern or modernized branches of botany can be utilized in taxon-

omy. An experimental garden is essential for the proper teaching of taxonomy. By experiments, students can learn much regarding the distinctions between phenotype and genotype, the importance of plasticity of characters, the taxonomic importance of hybridization and of its converse, genetic isolation, and the value of life-history studies revealing the many characters of structure and behaviour neglected by most floras, at least till quite recently. The plants grown and worked on should preferably be of known wild origin so that the significance of experimental results can be checked against behaviour in the field and linked up as far as possible with geographical range and ecological distribution. Species problems lead to an integration of orthodox taxonomy not only with the morphology of organs from roots to carpels but with all that is latest in plant physiology from trace elements and growth hormones to the chemistry and physics of genes and enzymes. Cytogenetics provides many data that can be used in taxonomy. Ecological characteristics as well as geographical range are accepted as of great taxonomic importance. The problems of phylogeny are at present capable of more scientific research at about the species level than at the level of families and larger groups, at least in the angiosperms. We should welcome much more knowledge of fossil flowering plants for incorporation at any level.

This then is the final conclusion: taxonomy should be so introduced to students that they quickly realize its practical and theoretical importance, appreciate the wealth of material that has to be classified and the range of form and function on which classification can be based, learn how modern taxonomy more and more links together data from all other branches of botany, and yet recognize that it is a progressive subject in its own right.

A few words might be added regarding the training of botanical students as taxonomists. The number of posts for professional, whole-time, taxonomists is limited. Only those students should be encouraged to take up taxonomy as a career who have a definite flair for it combined with unusual intelligence and a good background of general botanical knowledge and experience. It is doubtful if universities in the British Isles other than those in Edinburgh, Oxford, and Cambridge, can at present give anything like adequate specialist training in taxonomy. For this a botanic garden, with associated herbarium and library of sufficient extent, is essential. At Kew, we have not been entirely dissatisfied in recruiting graduates with a definite interest in taxonomy and a good general basis of botanical knowledge, and training them as specialists ourselves. It is about two years before they are capable, still under guidance, of carrying out research.

Personally I wish it were possible to evolve a scheme combining the good features of an apprenticeship system with a university training. Kew, however, is not linked with any one university and is a research not a teaching establishment.

At the present time, then, most university departments of botany should aim at giving all their students a fair insight into the matter, methods, and principles of plant taxonomy along the lines already suggested and should encourage the students capable of taking up taxonomy to obtain first a good general degree in botany and then to obtain special training at one of the few centres of taxonomic research, perhaps by being content for a time with a junior or temporary post or by means of a scholarship.

Flore du Maroc analytique, descriptive et illustrée

par

Ch. Sauvage et J. Vindt

(Lab. de Phanérogamie de l'Institut scientifique chérifien)

Le premier fascicule de cette flore vient de paraître. Il traite les *Ericales, Primulales, Plombaginales, Ebénales* et *Contortales* et porte sur près de 100 espèces. Edité à Tanger aux Editions internationales, il comprend 39 pages d'introduction avec une carte du Maroc, 142 pages de flore et 6 pages d'index. La distribution en sera assurée par la Société des sciences naturelles du Maroc, avenue Biarnay, Rabat (Maroc).

La conception de ce premier fascicule étonnera ou décevra sans doute nombre de

lecteurs. Si l'utilité d'une Flore du Maroc n'est pas à démontrer, fallait-il commencer par un ouvrage qui n'est, à première vue, fait que pour le spécialiste ? Aussi extraordinaire que cela paraisse, après les remarquables et nombreux travaux que la flore marocaine a suscités depuis un siècle et demi, celle-ci est encore trop insuffisamment étudiée pour envisager sur son sujet des ouvrages purement techniques ou pédagogiques, sauf dans un cadre géographique plus limité.

En effet, il existe encore au Maroc des régions mal connues, soit qu'elles recèlent dans leurs nombreux recoins des reliques à découvrir (c'est le cas de tous les massifs montagneux un peu accidentés), soit plus simplement qu'elles n'aient pas fait l'objet de prospections assez nombreuses ou assez poussées. Par ailleurs, certains genres nécessiteront au Maroc ou en Afrique du Nord une révision monographique par des spécialistes, lorsqu'on aura assemblé un matériel suffisant: c'est le cas des *Armeria* et des *Limonium* dans ce fascicule. Enfin une foule de détails biologiques ne sont pas encore connus: La plante est-elle annuelle ou vivace? Comment sont ses graines? Quand fleurit-elle? Pousse-t-elle exclusivement sur sol non calcaire? La plante marocaine est-elle bien celle que l'on appelle sous tel nom en Espagne ou en Algérie? Manque-t-elle dans le pays Zaïan alors qu'elle existe dans les régions avoisinantes? etc. Il est rare que pour une espèce quelconque (même assez commune) on soit en état de répondre complètement à toutes ces questions.

Fallait-il renoncer pour cela? Nous ne l'avons pas pensé et nous nous sommes mis au travail dès que nous avons pressenti que le très regretté R. Maire laisserait inachevée sa *Flore d'Afrique du Nord*. Nous avons cherché alors, sans empiéter dans le domaine de celle-ci qui devait tout résoudre, à faire un ouvrage qui, avant tout, soit le commentaire du remarquable *Catalogue des plantes du Maroc* d'E. Jahandiez et de R. Maire (complété ensuite avec L. Emberger). Ainsi, notre premier fascicule correspond au début de son tome III. On nous pardonnera sans doute d'avoir un peu bousculé l'ordre systématique pour essayer de faire oeuvre plus immédiatement utile.

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Bien que cette flore soit descriptive, il était peut-être inutile de revenir une fois de plus sur les plantes abondamment décrites dans les ouvrages classiques d'Espagne, de France, d'Italie ou d'Algérie. Mais nous nous sommes laissés surtout guider par une considération plus pratique; en principe, la description est d'autant plus longue qu'elle était plus nécessaire à la distinction de l'espèce correspondante d'avec ses voisines existant au Maroc.

Nous nous sommes efforcés d'expurger les clés analytiques de ces impossibilités irritantes qui les parsèment souvent. En outre, le lecteur trouvera parfois plusieurs clés pour déterminer les espèces des genres soit importants physionomiquement *(Erica)*, soit délicats systématiquement *(Limonium)*.

Enfin cette flore est illustrée. Dans le texte même, nous n'avons inclus que les dessins les plus indispensables (208 au total, exécutés par R. de Brettes), pour sauver le lecteur des mauvaises interprétations; le plus souvent ce sont des croquis sommairement exécutés d'après des échantillons d'herbier. Mais, parallèlement, paraîtra, également par fascicules, un atlas comprenant une planche par espèce, dessinée sur le vivant. Pour de nombreuses raisons, cet atlas est plus long à constituer, même en ce qui concerne les principales espèces: aussi nous sommes-nous décidés à en faire une publication séparée.

* * *

Certaines des difficultés rencontrées au cours de la rédaction méritent quelques commentaires:

NOMENCLATURE. — Notre but s'opposait en principe à tout changement de nomenclature par rapport au Catalogue. Chaque fois que nous l'avons fait, c'est donc contraints par des règles impératives ou simplificatrices. Nous ne pensons pas pour autant que la nature soit moins compliquée que l'ont décrite nos prédécesseurs; mais à une époque où l'on s'oriente vers une conception plus rigoureuse de la taxonomie, il n'est pas raisonnable de multiplier des divisions à l'intérieur de l'espèce, sans en avoir entrepris une étude expérimentale, dont il ne pouvait être question ici. Nous nous réservons de justifier chaque modification de nomenclature dans une publication spéciale *(Révision de l'herbier de l'Institut scientifique chérifien)*.

SYNONYMIE - REFERENCES BIBLIOGRAPHIQUES. — La synonymie et les références bibliographiques n'ont généralement pas été indiquées lorsqu'il s'agit de plantes décrites dans les ouvrages classiques d'Es-

pagne (Willkomm et Lange), France (Rouy) ou Italie (Fiori). Par contre, les nombreuses difficultés rencontrées nous ont incités à faciliter la tâche des botanistes et nous avons, dans tous les autres cas, cherché à être aussi complets qu'il est nécessaire, sans omettre l'iconographie la plus accessible.

* * *

Le deuxième fascicule est presque terminé et les bases des fascicules suivants sont déjà jetées. M. P. Jovet a accepté de rédiger la famille des *Orobanchacées*. Mais si la publication d'une flore du Maroc nous paraît une nécessité, nous sommes tout autant persuadés de l'imperfection de notre travail et nous ne saurions trop souhaiter que nos lecteurs nous fassent part largement de leurs critiques, de leurs suggestions et nous signalent les erreurs qu'ils rencontreront. Par ailleurs, nous serons toujours heureux de recevoir des récoltes faites au Maroc: plus notre documentation sera abondante, plus nous pourrons espérer faire oeuvre utile.

Systématisation des unités taxonomiques chez les végétaux supérieurs

par

Guy Roberty (Marseille).

L'histoire de la taxonomie botanique a mis en usage courant les expressions „système artificiel", „système naturel", dont l'une est pléonastique et l'autre vicieuse. En effet, par définition même, tout système est un artifice, plus ou moins commode, plus ou moins logique, destiné à classer un ensemble, surabondant, de faits, sous une forme intelligible et maniable.

Les épithètes artificiel et naturel ne doivent donc être employées, dans un système quelconque de classement, qu'à l'égard des unités ou des critères fondamentaux.

Ne voulant discuter ici, ni de ces unités, ni de ces critères, nous les supposerons établis, d'un accord unanime, tout en sachant fort bien qu'il n'en est pas ainsi. Notre définition des espèces, unités de base, comme „derniers systèmes énergétiques isolés par l'évolution d'un phylum biologique" demeure à nos yeux parfaitement valable (voir Candollea **10**: 293-344. 1948). Elle n'est pas ici en cause.

Le problème en cause est le suivant: l'espèce étant définie, comment délimiter les groupes immédiatement supérieurs: genre, tribu, sous-famille, famille? Dans la totalité des flores présentement classiques, la solution de ce problème repose sur des bases d'érudition pure; ainsi peut-on voir, côte à côte, dans une même famille, des genres de même amplitude morphologique et geographique, divisés, l'un en deux, l'autre en deux cents espèces: tels aspects d'un même caractère étant ici tenus pour anarchiquement fluctuants, là pour significativement distincts. L'indiscutable désaffection du grand public de notre temps pour la botanique systématique trouve certainement dans ce fait son excuse la plus valable: peu de choses, en effet, sont plus déconcertantes pour un non-spécialiste que ces disparités pratiques d'épaisseur entre des limites d'égale importance théorique. Pour y porter remède, dans la florule d'A.O.F. dont l'Office de la Recherche Scientifique Outre Mer nous a confié la rédaction, nous avons adopté un système rigoureux et constant.

Ce système repose sur une séparation absolue entre l'évolution, phénomène de temps, et l'adaptation, phénomène d'espace. La famille, la sous-famille, la tribu, le genre, constituent les stades, strictement temporels, que nous pouvons percevoir au plus près des espèces, termes actuels de l'évolution. Un genre se distingue de la tribu dont il procède par un nombre plus grand de caractères fixés. En revanche, deux genres de même tribu se distinguent entre eux par des aptitudes, des adaptations, différentes.

Si l'on veut systématiser, graphiquement, ces notions élémentaires, un premier axe est aussitôt fourni par le déroulement, orienté, irréversible, du temps. Selon la symbolisation mathématique de l'indépendance, le second axe, d'espace, doit être perpendiculaire au premier. Sur cet axe, toutefois, la réversibilité devient possible: nous connaissons tous de nombreux exemples d'adaptations successives et opposées dans un même phylum. Nous savons également qu'il est, pour les végétaux supérieurs, deux adaptations possibles: anémophilie ou zoophilie. Ces deux adaptations opposées portent sur la dispersion des semences ou du pollen, donc sur l'apparence des fruits ou des fleurs.

Au même stade d'un même groupe phylétique, les divers compartiments possibles

sont donc susceptibles d'une présentation linéaire, allant du maximum d'anémophilie au maximum d'entomophilie.

La duplication numérique des gènes, accompagnée ou non de celle des chromosomes, constitue, on le sait, une barrière génétique, d'essence bio-temporelle, absolue. Ainsi nous disposons d'une hypothèse de base dans le classement respectif des stades d'un même phylum: si le premier stade a fixé *n* caractères, donc mis en oeuvre *n* gènes, le second stade en devra fixer *2n*, le nombre, comparable, de gènes disponibles étant alors *2n*, et ainsi de suite. Or l'observation parait montrer que *8n* constitue un maximum dans le dédoublement, numérique, des chromosomes; au delà de ce nombre interviennent des regroupements de la masse chromatique, regroupements liés à des relais ontogénétiques dans les orthogénèses organiques, ces deux phénomènes liés constituant ce que Gaussen nomme „surévolution". Nous pouvons, identifiant, par système, la famille, sensu stricto, unité de formes, au „pseudo-cycle" gaussénien, unité de temps, y définir successivement:

trois sous-familles, distinguées par les trois valeurs, a (anémophile), x (non spécialisée), A (zoophile), d'un seul et même caractère (ou groupe de caractères) primordialement important:

trois fois cinq tribus, 2b, b, x, B, 2B;

trois fois cinq fois neuf genres, 4c, 3c, 2c, c, x, C, 2C, 3C, 4C;

trois fois cinq fois neuf fois dix-sept espèces, 8d, 7d .... 7D, 8D.

Ces nombres constituent des bases théoriques; les nombres effectifs peuvent être plus petits, si la famille est mal venue, relicte ou nouvelle-née; ils peuvent aussi être plus grands. Les symboles adoptés ci-dessus, en effet, sont additionnels. Si le genre a.2b.4c, d'un phylum quelconque, ne comporte qu'une seule possibilité d'expression, les genres a.x.x, x.B.c, etc.... en revanche, en comportent un assez grand nombre. Ainsi la tribu x peut, en fait, s'exprimer dans les arrangements et donc les formes, sub-tribales (post-tribalement fixées), Bb, bB, xx. Le genre x, quelle que soit sa tribu, peut se fixer, sub- (post-) génériquement, dans seize arrangements différents: CCcc, ..., ccCC, Ccxx, ..., xxcC, xxxx.

Or, si les divers arrangements d'une même combinaison actuelle ne constituent qu'une seule et même unité biologique (génétique), en revanche, une fois cette combinaison devenue inactuelle, ces arrangements distincts, fixés et non plus fluctuants, deviennent des sous-unités distinctes, avant chacune sa filiation, ses espèces actuelles propres. Notons en passant qu'ici notre système rend compte d'un fait bien connu: maximum de variabilité d'un groupement biologique au plus près de son berceau géographique, là où l'adaptation est la moins intense, parceque la moins nécessaire, là donc où se trouveront les combinaisons médianes (comportant un ou plusieurs x) et non pas seulement des combinaisons extrêmes.

Avant d'appliquer ces normes systématiques, indiscutablement commodes, tant pour user du texte ainsi construit que pour le rédiger, une précaution reste indispensable: cette non confusion, sur laquelle nous avons déja insisté, entre caractères évolutifs et caractères adaptatifs. En effet, ces classements linéaires ne peuvent être linéaires que s'ils recoupent, en un seul et même point l'axe du temps. On doit ainsi, à l'intérieur d'une famille classique, dégager d'abord, non les sous-familles, sensu nostro, mais bien ces sous- (para- ?) familles qui se distinguent du groupe central par un état évolutif, soit plus, soit moins, avancé.

Chez les *Sapotacées*, par exemple, on peut opposer, au stade tribal, les calices à sépales plus ou moins nombreux et plus ou moins imbriqués. Cependant cela n'est possible que si, préalablement, les *Synsepalum*, au calice gamosépale, comme les *Haplostigma*, au calice s'ouvrant par éclatement inégal, ont été séparés comme „para"-familles, la première, Synsepaloïdées, plus évoluée, la seconde, Haplostigmoïdées, plus archaïque.

A propos d'un livre récent sur la Morphologie du Pollen*

par

Charles Baehni (Genève)

Bien des éléments caractéristiques de l'ouvrage de G. Erdtman qui vient de sortir de presse en font un livre qu'on aime avoir à portée de main. Tout d'abord sa présen-

*) G. Erdtman: Pollen Morphology and Plant Taxonomy. Angiosperms. Almquist & Wiksell. Stockholm. The Chronica Botanica Co. Waltham, Mass. U.S.A. 1952.

tation impeccable, puis l'arrangement des familles par ordre alphabétique qui en rend l'emploi aisé aussi bien aux adeptes du système englérien qu'à ceux qui utilisent celui de Bentham & Hooker. Ensuite, le fait que dans ce gros volume (539 p.) presque toutes les familles sont illustrées par des dessins (d'une qualité rare) et qui contrebalancent largement les difficultés qu'il y a, pour un non-spécialiste, à lire un texte où des mots inventés pour la cause (mais expliqués dans un glossaire parfaitement clair) se trouvent à chaque ligne. Les sources bibliographiques figurent en tête de chaque famille et, ô miracle! les spécimens d'herbier sont identifiables par le nom du collecteur et leur numéro. Ainsi les doutes, s'il y en avait, pourraient être facilement levés ou confirmés: on possède un instrument de travail propre et honnête.

Venons-en cependant à l'essentiel, ce qui nous oblige à rappeler quelques traits de l'évolution de la systématique. Lorsqu'à la fin du XVIIIe siècle et au commencement du XIXe on fit (ou refit) la découverte des groupements naturels, la synthèse rejeta l'analyse dans l'ombre; on voulait mettre en avant tout ce qui pouvait servir à réunir, laissant (par ignorance réelle ou par désir de simplification) tout ce qui divisait. On aboutit ainsi à des systèmes dont un long usage a confirmé la valeur. Cependant l'essor des méthodes de l'anatomie, puis de la morphologie comparées, de l'analyse chimique et de la génétique, permettait dans le même temps d'acquérir une vue plus juste de certains faits qui seraient venus, sinon bouleverser, du moins modifier profondément parfois, les idées généralement reçues. L'inertie très grande et, il faut le dire aussi, le sentiment obscur que ces travaux d'anatomie, de morphologie, de chimie, n'avaient pas été exécutés à la même échelle que les grandes synthèses qui les précédaient, empêchèrent les botanistes d'incorporer dans leurs systèmes tous les éléments nouveaux.

Ce qui manquait, et ce qui manque encore, (le livre d'Erdtman est l'une des trop rares exceptions) ce sont de vastes études comparatives où l'on reprendrait point par point les éléments autrefois ignorés ou généralisés en vue de construire les systèmes, et qui pourraient servir de base à une refonte de ces derniers.

Pour toutes les branches de la morphologie, l'évidence même est que nous avons besoin d'une façon pressante d'une vérification *par le détail* des observations nécessairement générales utilisées pour les synthèses, et ici détail signifie que les caractères doivent avoir été vus jusqu'à l'échelon systématique employé par les disciplines modernes: l'espèce et les taxa subordonnés. Tous les jours la nécessité se fait sentir d'une certitude absolue et non plus relative, que seules peuvent donner les généralisations fondées sur des études minutieuses, comparables, et où les faits seraient étudiés pour ainsi dire en travers des classifications, en tout cas en dehors d'elles — pour être ensuite reclassés si possible. Que ce travail soit nécessaire, même en matière de palynologie, on en trouve la preuve dans le fait que le pollen a fait l'objet de 26 travaux chez les Acanthacées (une grande famille où l'étude du pollen est traditionnelle), alors que chez les Scytopétalacées, les Garryacées, les Fouquiéracées (petites familles, il est vrai) Erdtman n'en avait aucun à citer, hormis les siens propres.

Cet auteur (et c'est un compliment qu'on peut lui faire) s'inscrit donc dans la lignée des Gaertner, des Solereder, des Wehmer; pour la première fois, on trouve réunies les observations jusqu'ici détachées d'une foule de chercheurs et celles du Laboratoire de Palynologie de Bromma.

Sans doute un manuel comme celui-ci va-t-il provoquer de nouvelles recherches dans le domaine de la morphologie du pollen. Mais tel qu'il est, et plus encore avec le second volume qu'on annonce et qui sera consacré aux Gymnospermes, aux Fougères et aux Mousses, il trouvera un accueil chaleureux, en première ligne auprès des systématiciens, mais aussi des phytogéographes, des généticiens et de tous ceux qui s'occupent à des degrés divers de recherches sur le pollen: archéologues, géologues, apiculteurs mêmes, d'autres encore. Or, comme le dit l'auteur dans sa préface, un tel livre est né d'un échec rencontré au cours d'analyses polliniques dans les marécages canadiens; c'est une belle preuve d'énergie et l'on peut être certain, par conséquent, qu'Erdtman ne se contentera pas de cette réunion en un seul faisceau des travaux de ses devanciers et de son école, donnant seulement quelques exemples de sa science. Il nous doit, après cette première mise au point, une liste de toutes les espèces qu'il a vues et où les écarts par rapport au type générique ou familial seront soigneusement relevés. Alors nous aurons non plus un Manuel de Palynologie, mais un Précis que l'auteur pourrait nous écrire, comme on s'en convainc en lisant sa préface.

Quand nous aurons en main d'autres ouvrages comparables à celui-ci et qui décriront les divers organes de la plante, avec la même science et le même détachement des idées préconçues, alors nous serons en droit d'espérer un renouveau de la systématique. Elle en a bien besoin.

Nomenclature committees

Special Comittee for Pteridophyta and Phanerogamae

Subcommittee for Pteridophyta

Secretary: Prof. Dr R. E. G. Pichi-Sermolli, Herbarium Universitatis Florentinae, Istituto Botanico, Via Lamarmora 4, *Firenze*, Italy.

The Secretary circulated among the Members of the Subcommittee a first part of the reports prepared by him on the generic names proposed for conservation. The Subcommittee adopted unanimously the following Nomina Generica Conservanda:

NOMINA CONSERVANDA

Angiopteris Hoffm. Comm. Soc. Reg. Gott. **12**: 29. 1796.
T.: *A. evecta* (Forst.) Hoffm.

Coniogramme Fée, Gen. Fil. 167. 1852.
T.: *C. javanica* (Bl.) Fée [*C. fraxinea* (Don) Diels].

Gleichenia Smith, Mém. Acad. Sci. Turin. **5**: 419. 1793.
T.: *G. polypodioides* (L.) Smith.

Schizaea Smith, Mém. Acad. Sci. Turin. **5**: 419. 1793.
T.: *S. dichotoma* (L.) Smith.

NOMINA REJICIENDA

Angiopteris Adans. Fam. **2**: 21. 1763.
T.: *A. sensibilis* (L.) Nieuwland.

Nothogramme Presl, Epim. Bot. 263. 1851.
T.: *N. japonica* (Thunb.) Presl.

Gleichenia Necker, Elem. Bot. **3**: 314. 1790.
T.: No binary combination has been established.

Lophidium Richard, Act. Soc. Hist. Nat. Paris. **1**: 114. 1792.
T.: *L. latifolium* Richard [*L. elegans* (Vahl) Presl].

Janchen's proposal for the conservation of *Polystichum* (cfr. Intern. Code Bot. Nom. p. 84) was rejected with 5 votes against and 2 in favour, since the name **Polystichum** Roth, Tent. Fl. Germ. **3**: 31, 69. 1799. [T.: *P. lonchitis* (L.) Roth] does not need conservation being perfectly in accordance with the Code of Nomenclature.

Special Comittee for Algae

Secretary: Dr Tore Levring, Marine Botanical Institute, Botanical Garden, *Gothenburg*, Sweden.

The Secretary sent a circular letter to all phycologists, accompanied by a voting form. The letter runs:

Although, generally speaking, phycologists by themselves cannot effect changes in the International Code of Botanical Nomenclature, the conservation of generic (and family) names of algae constitutes an important exception. Proposals for the conservation of names are given provisional approval or disapproval by the joint Advisory Board of Nomenclature and General Committee of Botanical Nomenclature (the two committees replacing the former Executive Committee), guided by recommendations from the Special Committee concerned.

Fifty-four generic names of algae had been conserved up to the time of the Stockholm Congress. In addition, many generic names had been proposed for conservation but not officially acted upon by any congress. It was hoped that the Executive Committee of the Stockholm Congress would either provisionally approve or disapprove these proposals. However, these proposals were not acted upon at Stockholm but were referred to the Special Committee for Algae for consideration.

In order that the delegates (and especially

the Special Committee for Algae) at the forthcoming Paris Congress be instructed as to the wishes of the persons they will represent, it is desirable that a preliminary, unofficial poll be taken. It is hoped that all phycologists will give this undertaking their serious consideration and cooperation. In the paper by P. C. Silva *) an attempt has been made to bring together all proposals for the conservation of generic names of most groups of algae (Chlorophycophyta, Chrysophycophyta except Bacillariophyceae, Phaeophycophyta, Myxophycophyta and Rhodophycophyta). All published *pro* and *con* arguments are presented and certain additional ones are given by the author. It is hoped that this summary of nomenclatural conservation in the algae will prove helpful to phycologists in deciding whether a proposal is desirable or undesirable. Please note that some of the generic names which have been proposed for conservation are not actually in need of conservation (cf. the tabular summary at the end of the article, pp. 308-311). Should you wish to support your *yes* or *no* vote with written statements, please feel free to do so.

*) cf. Taxon **1**: 132. 1952.

THE SOUTH AFRICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

ADVISORY COMMITTEE ON PROBLEMS OF BOTANICAL NOMENCLATURE AND ASSOCIATED MATTERS

1. On the proposal of the Committee of Section (B) Botany (1952) of the South African Association for the Advancement of Science, the Council of the Association has appointed (15.8.52) a Committee of 3, Dr. R. A. Dyer (Convener), Professor R. S. Adamson and Dr. M. R. Levyns, to act as an advisory body in the Union on problems of botanical nomenclature and allied matters.

2. The establishment of this Advisory Committee is an endeavour to obtain greater uniformity in outlook in plant systematics in the Union.

3. When it met in Cape Town in 1951, the Botanical Survey Advisory Committee expressed itself in favour of the creation of such a body.

4. The Committee will have two main functions:

(a) to advise and assist on problems connected with systematics and especially with those connected with nomenclature and interpretation of the International Rules;

(b) to act as a link between botanists in South Africa and the International Committee for Urgent Taxonomic Needs and other international bodies dealing with taxonomy. In this capacity the Committee would consider and if necessary transmit any proposals for changes in the Rules, for conservation or rejection of generic names, and similar matters.

5. While the Committee will be purely advisory, it is hoped that individual botanists in the Union will consult it on all relevant matters and especially before making radical changes in classification or altering established names.

6. Botanists may consult individual members of the Committee who may advise directly but who will consult on all critical matters. The Committee will exercise its power to co-opt whenever it is deemed desirable to do so.

7. Relative to the objectives of the Committee, attention may be drawn to the establishment in 1950 of the "Association pour l'Etude Taxonomique de la Flore d'Afrique Tropicale" (A.E.T.F.A.T.). One of the chief aims of the body is "to correlate work on floras (Tropical African) in course of preparation by attempting to reach agreement on nomenclature of species common to these floras and as far as possible on the major points of taxonomy involved".

A criticism sometimes levelled at plant taxonomists is that their published work does not meet with general agreement. This may be inevitable but it must be fully appreciated by taxonomists that on them rests the responsibility of arriving at a stable nomenclature.

The co-operation of all botanists in the Union is solicited in this essential objective.

R. A. Dyer,
Convener of Committee.

22nd October, 1952.

Huitième Congrès International de Botanique - Paris, Juillet 1954
Eighth International Botanical Congress - Paris, July 1954

Section de Nomenclature

Les propositions concernant le Code International de la Nomenclature Botanique (1952) doivent être soumises au Rapporteur-Général Dr J. Lanjouw avant le 1er Décembre 1953. On pourra publier toutes les propositions dans Taxon. Les botanistes qui ont en vue quelque proposition, sont instamment priés d'y donner la formule qui sera publiée dans Taxon vol. 2 n. 2 (Mars 1953).

Bureau du Rapporteur-Général:
International Bureau for Plant Taxonomy and Nomenclature, Lange Nieuwstraat 106, Utrecht — Hollande.

Section Nomenclature

Proposals regarding the International Code of Botanical Nomenclature (1952) must be submitted to the Rapporteur-Général Dr J. Lanjouw before 1 December 1953. All proposals can be published in Taxon. Botanists preparing proposals are earnestly requested to give them the form of the example which will be published in Taxon vol. 2 no. 2 (March 1953).

Office of the Rapporteur-Général:
International Bureau for Plant Taxonomy and Nomenclature, Lange Nieuwstraat 106, Utrecht — Netherlands.

W. C. WORSDELL, A.L.S.

by

J. Hutchinson (Kew)

Naturalists, especially botanists, are notoriously long-lived, contrasted with business men who frequently die from inactivity after retirement. Sir Joseph Dalton Hooker added to his fame by reaching his 95th year, a record exceeded by Mr H. N. Ridley who at the time of writing (November 1952) is approaching his 98th year. Both of these botanists spent a considerable period of their lives in the tropics.

Out of curiosity, a short time ago, the writer compiled a list of British naturalists who had lived to be 80 years old or more, and whose interests were mainly but not exclusively botanical. No fewer than 380 came under this category. Of these only about 9 lived to be 90 years of age or more, prominent among them, besides Hooker, being Sir John Kirk (90 years), John Miers (90 years), R. C. Alexander Prior (93 years), Sir Edward Sabine (95 years), Sir Hans Sloane (93 years), Sir Richard Strachey (91 years), Alfred Russell Wallace (90 years), and the Rev. George Henslow (90 years).

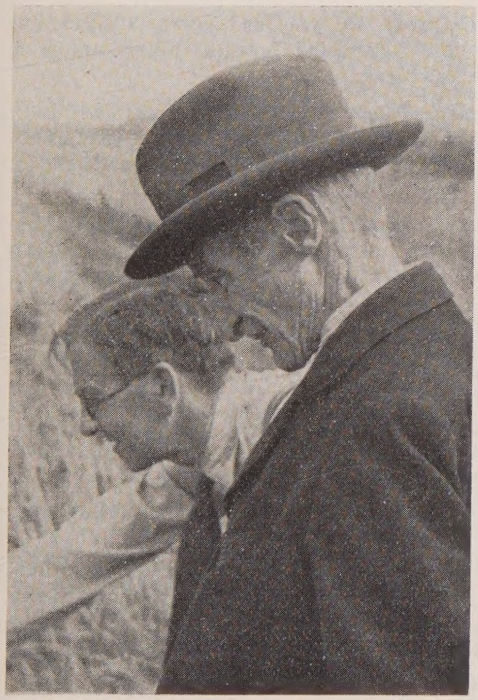
On September 15th, 1952, Mr W. C. Worsdell celebrated his 85th birthday, and his many friends at the Kew Herbarium hope he will be spared for several more years to continue the valuable translation work he carries out from various languages for members of the staff.

Worsdell was born at Aloona, Pennsylvania, U.S.A., in 1867, where his father was employed by the local railway company. On his parents' return to England when he was 4 years of age, he lived at the railway town of Crewe in Cheshire, where his father was manager of a large steel-works. At 9 years he was sent to a boarding school at Egremont, kept by Quaker ladies, his parents being members of the Society of Friends. In 1880 he was transferred to the Friends' public school at Sidcot, in the Mendips, Somerset, his interest out of school hours being butterflies and tame dormice. In 1882 he was sent to Queenwood College, near Stockbridge, Hants., where he acquired an elementary knowledge of German. On leaving he chose horticulture as a career, and spent 2½ years as a pupil in a nursery in Holland, and gained a thorough knowledge of the Dutch language. After that he spent two years as a semi-pupil in the nurseries of Fisher Son and Sibray at Handsworth, near Sheffield, and in the evenings attended a botanical course in Sheffield conducted by Professor A. Denny. Worsdell then deserted the practical side for the more purely botan-

ical, attending a course of botany at the Royal College of Science, South Kensington, given by Dr D. H. Scott. After this he assisted Dr A. B. Rendle to set up a permanent exhibit in the main hall of the British Museum (Natural History) of specimens illustrating the different parts of plants, and some teratological specimens. In the subsequent South Kensington examination he took a second-class honours in botany.

Worsdell's activities were then transferred to the Royal Botanic Gardens, Kew, making drawings for Dr Scott at that time honorary Keeper of the Jodrell Laboratory, and in writing papers for the "New Phytologist". Many years were spent investigating on his own account the anatomical structure of the stems and leaves of *Cycadaceae* and *Coniferae*, resulting in a paper at the British Association meeting at Bradford in 1900.

In the early 1900's Worsdell acted as demonstrator in botany at University College, London, under Professor F. W. Oliver, two of the elementary students at that time being the present Director of Kew and Dr Marie C. Stopes.



W. C. Worsdell botanising with C. E. Hubbard; September 1950, at Amberley Wald Brooks, Sussex, Great Britain.

In February 1909 Worsdell went to South Africa for one year as Acting Professor of Botany during the absence on leave in England of Professor Pearson, and from 1912-13 he stood in for Miss Duthie, at the Victoria College, Stellenbosch. During these periods in South Africa he made large collections of the native flora (now at Birmingham University), visiting among other places South-West Africa where at 40 miles east of Swakopmund, at Welwitsch, he revelled in the company of hundreds of living specimens of the genus *Welwitschia*, one large specimen measuring 6 ft. across the crown.

On resuming work in the Jodrell Laboratory at Kew, Worsdell investigated the stem structure of certain dicotyledons, the outcome of which was the discovery that the so-called "internal phloem" of some stems, especially of *Cucurbitaceae* and *Compositae* is merely the remnants of a system of medullary vascular bundles, the xylem of which has become abortive, but here and there sporadically preserved.

After seven years' retirement in Westmorland and Devon, Worsdell returned to Kew and was engaged to assist Dr Stapf in compiling the "Index Londinensis", and after Dr Stapf's death the two supplementary volumes.

In addition to numerous papers in various scientific journals Worsdell published through the Ray Society 2 volumes entitled "The Principles of Plant-Teratology" (1915-16) which became a standard work in place of Masters' book on the same subject.

At an early period Worsdell was elected an Honorary Fellow of the Royal Horticultural Society, and was for some years a member of its Scientific Committee. In 1898 he was elected a Fellow of the Linnean Society, and after 21 years membership an Associate.

Besides his botanical activities Worsdell belonged to the Theosophical Society, and for many years he was a member of a well known Chiswick debating society, such celebrated personalities as Gilbert and Cecil Chesterton being fellow members. He also belonged to the Bacon Society, and to the "National Antivivisection Society", "The Royal Society for the Prevention of Cruelty to Animals", "Our Dumb Friends' League", and "The National Society for the Abolition of Cruel Sports", such as foxhunting. He has also been a regular reader at home of fic-

tional, philosophical, biographical and poetical literature, amongst his favourites being Wordsworth, Shelley, Byron, Scott, Mrs Hemans, and Goldsmith.

In 1920, at Ashford, Kent, Worsdell married Miss Dorothy Johnson, a member of the Society of Friends, who died in March, 1939, shortly before the outbreak of the second World War. Since then he has lived alone at Twickenham, a few miles from the Kew Herbarium which he visits regularly.

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"Taxon" is directed by: Prof. J. Lanjouw, Chief Editor, and Dr F. A. Stafleu, Assistant Editor. All correspondence should be sent to the International Bureau for Plant Taxonomy and Nomenclature, 106 Lange Nieuwstraat, Utrecht — Netherlands.
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